



Master Course Syllabus

For additional course information, including prerequisites, corequisites, and course fees, please refer to the Catalog: <https://catalog.uvu.edu/>

Semester: Spring

Year: 2025

Course Prefix: MATH

Course and Section #: 3250 section 001

Course Title: Introduction to Advanced Calculus

Credits: 3

Course Description

Math 3250 introduces mathematical logic and proof. It covers the first topics of advanced calculus including the axioms of the real numbers, sequences, mathematical induction, limits, topology of the real numbers, continuity, differentiation, and integration.

Course Attributes

This course has the following attributes:

- General Education Requirements
- Global/Intercultural Graduation Requirements
- Writing Enriched Graduation Requirements
- Discipline Core Requirements in Program
- Elective Core Requirements in Program
- Open Elective

Other: *Click here to enter text.*

Instructor Information

Instructor Name: Dr. David Fearnley

Student Learning Outcomes

Upon successful completion, students should be able to . . .

Use logical inferences, axioms, and set constructions to form mathematically correct proofs.

Prove theorems using the axioms of the real numbers, the least upper bound property, cardinality, sequences, and convergence.

Prove theorems using the Principle of Mathematical Induction and the Bolzano-Weierstrass Theorem.

Upon successful completion, students should be able to . . .

Prove theorems relating to limits and topology of the real line, continuity and uniform continuity, including the Intermediate Value Theorem, the sequential characterization of limits and the Extreme Value Theorem.

Prove theorems pertaining to differentiation, including the product, quotient, sum, and chain rules, and the Mean Value Theorem.

Prove theorems relating to integrability and integration.

Write effective mathematical content, such as for proofs or articles, following the current conventions of the mathematical community.

Course Materials and Texts

Advanced Calculus (current form, free text written by the instructor, available on Canvas)

Course Requirements

Course Assignments, Assessments, and Grading Policy

Homework: Written homework is 25% of your grade in total. This is broken up into general written assignments and the Section 5 written assignment from the notes, which is handled differently. Together, the other written assignments make up 15% of your grade. Students should hand in five problems from each section we cover other than the chapter 5 assignment, in which ten problems must be done, though it is recommended that students do all problems in each section for practice. The Section 5 written assignment makes up 10% of your grade. Board presentations of completed problems are encouraged but not required. For all sections apart from Section 5, if you complete a problem without referring to other materials or getting help from others and that problem has not yet been presented then you can present that problem at the board. To give others a chance to present and give students more practice on written assignments, no student will present more than one problem (successfully) from a given section and presentations can only be made for two sections apart from section 5 (so each student will submit at least three written assignments, including section 5). If a student presents a problem on the board (including a fully written out proof) and the solution is correct then that student will get 100% on the written problems for that section and does not have to hand in that section. If there are mistakes then if they are small the student might be able to correct them at the board. If there are conceptual errors, typically they are described and the student is free to try again another time. While help is not permitted on board presentation problems prior to presenting, students are welcome to offer helpful suggestions and corrections while the student is at the board. Everyone must hand in the section 5 homework assignment. The Section 5 assignment will be handed in as a draft and then returned with correction feedback. The assignment will then be resubmitted for credit. All other assignments are submitted for

credit without the re-drafting process. Homework assignments are due two class days after we finish covering theorems for the section corresponding to that assignment. Students are free to collaborate on problems they do not intend to present at the board, and such collaboration is encouraged. However, it is important to learn how to write mathematics in this class, and students should hand in proofs written in their own words (do not just copy another student's work). Once we have passed the due date for a given section's problems, board presentations of problems corresponding to that section are no longer accepted for credit. About a week after each section is handed in, solutions will probably be posted. Assignments handed in after that time are normally accepted for only half credit, but you can use the solutions that are posted and so the assignment is only graded for completeness.

Tests: There will be three tests preceding the final. The tests will cumulatively constitute 45% of your grade. Students will typically be given six problems, three of which are theorems from the notes (old theorems that have been seen before) and three of which are new theorems (which may be theorems the students have never seen before, or in some cases homework problems or modified homework problems). The student will then do four of the six theorems. Tests will probably not be given late unless the student is quite ill on the day of the test, or has a UVU approved school function or similarly unavoidable emergency. Students should be prepared to provide evidence of their reason for missing the exam (such as a doctor's note). A busy schedule, not being aware of the test, or just being out of town are not normally acceptable excuses for missing a test on the scheduled day. Students who miss a test for reasons which are not acceptable excuses cannot make the test up and their test score is zero. There are no re-takes and there is no extra credit. In some borderline cases where an excuse is not sufficient (but is fairly reasonable) a compromise may be offered wherein the student may take a more difficult version of the exam late.

SRI Submission: To incentivize filling out SRIs at the end of the semester, students filling out their SRI will receive a one half of one percent grade improvement as extra credit.

Final Examination: The final exam is 30% of your grade and is given on April 30 in class at 11:00-12:50. Except in exceptional emergencies students may not take the final early or late. Students will not normally receive a grade lower than that which would correspond to their final exam score percentage minus 10% (even if their course average would be below that amount).

Grading: Grades are essentially distributed according to the following ranges:

A is 90-100,

A- is 86-89,

B+ is 82-85,

B is 77-81,

B- is 73-76,

C+ is 69-72,

C is 63-68,

C- is 59-62,

D+ is 55-58,

D is 50-54,

D- is 45-49, and below 45 is an E. Averages between two points are generally rounded to the nearest point except in the cases of C, C- and D- grades, where scores are always rounded up to those grades if within less than one percentage point. Proof courses tend to be somewhat challenging, and you may find that your test scores in such classes are lower than those you are used to. This expanded grading scale is intended to reflect that additional difficulty and compensate for lower scores. Most tests are not curved, even if the average is low.

Required or Recommended Reading Assignments

It is recommended that students follow the text as we cover each topic. Reading a couple of pages ahead of where we finish before each class is likely to improve student understanding.

General Description of the Subject Matter of Each Lecture or Discussion

It is fairly difficult to predict how long each section will take, and this will depend on what things the class has difficulty with, when people present board theorems and that sort of thing. However, it is planned for chapters 1 and 2 to be the material for the first test, chapters 3 and 4 for the second test, and chapter 5 and probably some of chapter 6 will be the material for the third test. As a tentative plan we may have test 1 on around January 29, test 2 around March 5, and test 3 around April 23. The final exam is on April 30 in class at 11:00-12:50. The chapter 1 and 2 material is on axioms of a complete ordered field, absolute value and the structure of the real numbers, induction and logical proofs. The chapter 3 and 4 material includes sequence convergence, limits, continuity, uniform continuity, the Bolzano-Weierstrass Theorem, the Extreme Value Theorem, the Intermediate Value Theorem and the Sequential Characterization of limits, but what day which things are covered depends largely on whether students seem prepared to move on to the next topic.

Required Course Syllabus Statements

Generative AI

Use of Artificial Intelligence: AI programs are not a replacement for your human creativity, originality, and critical thinking. Writing, thinking, and researching are crafts that you must develop over time to develop your own individual voice. At the same time, you should learn how to use AI and in what instances AI can be helpful to you.

The use of generative AI tools (e.g. ChatGPT, Google Bard, etc.) is permitted in this course for the following activities:

- Brainstorming and refining your ideas;
- Fine tuning your research questions;
- Finding information on your topic;
- Drafting an outline to organize your thoughts; and
- Checking grammar and style.

The use of generative AI tools is not permitted in this course for the following activities:

- Impersonating you in classroom contexts, such as by using the tool to compose discussion board prompts/responses assigned to you or content that you put into a Teams/Canvas chat.
- Completing group work that your group has assigned to you, unless it is mutually agreed upon that you may utilize the tool.
- Writing a draft of a writing assignment.
- Writing entire sentences, paragraphs or papers to complete class assignments.

You are responsible for the information you submit based on an AI query (for instance, that it does not violate intellectual property laws, or contain misinformation or unethical content). Your use of AI tools must be properly documented and cited in order to stay within university policies on academic honesty.

Any student work submitted using AI tools should clearly indicate what work is the student's work and what part is generated by the AI. In such cases, no more than 25% of the student work should be generated by AI. If any part of this is confusing or uncertain, please reach out to me for a conversation before submitting your work.

Using Remote Testing Software

This course does not use remote testing software.

This course uses remote testing software. Remote test-takers may choose their remote testing locations. Please note, however, that the testing software used for this may conduct a brief scan of remote test-takers' immediate surroundings, may require use of a webcam while taking an exam, may require the microphone be on while taking an exam, or may require other practices to confirm academic honesty. Test-takers therefore shall have no expectation of privacy in their test-taking location during, or immediately preceding, remote testing. If a student strongly objects to using test-taking software, the student should contact the instructor at the beginning of the semester to determine whether alternative testing arrangements are feasible. Alternatives are not guaranteed.

Required University Syllabus Statements

Accommodations/Students with Disabilities

Students needing accommodations due to a permanent or temporary disability, pregnancy or pregnancy-related conditions may contact UVU [Accessibility Services](#) at accessibilityservices@uvu.edu or 801-863-8747.

Accessibility Services is located on the Orem Campus in BA 110.

Deaf/Hard of Hearing students requesting ASL interpreters or transcribers can contact Accessibility Services to set up accommodations. Deaf/Hard of Hearing services can be contacted at DHHservices@uvu.edu

DHH is located on the Orem Campus in BA 112.

Academic Integrity

At Utah Valley University, faculty and students operate in an atmosphere of mutual trust. Maintaining an atmosphere of academic integrity allows for free exchange of ideas and enables all members of the community to achieve their highest potential. Our goal is to foster an intellectual atmosphere that produces scholars of integrity and imaginative thought. In all academic work, the ideas and contributions of others must be appropriately acknowledged and UVU students are expected to produce their own original academic work.

Faculty and students share the responsibility of ensuring the honesty and fairness of the intellectual environment at UVU. Students have a responsibility to promote academic integrity at the university by not participating in or facilitating others' participation in any act of academic dishonesty. As members of the academic community, students must become familiar with their [rights and responsibilities](#). In each course, they are responsible for knowing the requirements and restrictions regarding research and writing, assessments, collaborative work, the use of study aids, the appropriateness of assistance, and other issues. Likewise, instructors are responsible to clearly state expectations and model best practices.

Further information on what constitutes academic dishonesty is detailed in [UVU Policy 541: Student Code of Conduct](#).

Equity and Title IX

Utah Valley University does not discriminate on the basis of race, color, religion, national origin, sex, sexual orientation, gender identity, gender expression, age (40 and over), disability, veteran status, pregnancy, childbirth, or pregnancy-related conditions, citizenship, genetic information, or other basis protected by applicable law, including Title IX and 34 C.F.R. Part 106, in employment, treatment, admission, access to educational programs and activities, or other University benefits or services. Inquiries about nondiscrimination at UVU may be directed to the U.S. Department of Education's Office for Civil Rights or UVU's Title IX Coordinator at 801-863-7999 – TitleIX@uvu.edu – 800 W University Pkwy, Orem, 84058, Suite BA 203.

Religious Accommodation

UVU values and acknowledges the array of worldviews, faiths, and religions represented in our student body, and as such provides supportive accommodations for students. Religious belief or conscience broadly includes religious, non-religious, theistic, or non-theistic moral or ethical beliefs as well as participation in religious holidays, observances, or activities. Accommodations may include scheduling or due-date modifications or make-up assignments for missed class work.

To seek a religious accommodation, a student must provide written notice to the instructor and the Director of Accessibility Services at accessibilityservices@uvu.edu. If the accommodation relates to a scheduling conflict, the notice should include the date, time, and brief description of the difficulty posed

by the conflict. Such requests should be made as soon as the student is aware of the prospective scheduling conflict.

While religious expression is welcome throughout campus, UVU also has a [specially dedicated space](#) for meditation, prayer, reflection, or other forms of religious expression.